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Journal of the Society of Arts.

FRIDAY, FEBRUARY 5, 1858.

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TENTH ANNUAL EXHIBITION OF INVENTIONS.

Monday, the 5th of April, is fixed for the opening of the Society's Tenth Annual Exhibition of *recent* Inventions.

Persons intending to contribute to the Exhibition should communicate with the Secretary of the Society of Arts as soon as possible, stating—

1. The title of the Invention.
2. Whether the article will be a Specimen, Model, or Drawing.

Articles for exhibition must be forwarded to the Society's House, Adelphi, London, W.C., *carriage paid.*

The days for receiving articles are, Thursday, the 18th; Friday, the 19th; and Saturday, the 20th of March; and no articles can be received after the last of these days.

All articles should be accompanied with a brief but clear description of the invention, with a wood-block (when possible) for illustrating the Catalogue, and a reference to any publication in which the Invention is described.

All drawings exhibited must be framed.

ARTISTIC COPYRIGHT.

A Report as to the existing English Common and Statute Law, relating to this subject, has been prepared at the request of the Committee, by D. Roberton Blaine, Esq., Barrister-at-Law, Reporter to the Committee, and may be obtained of the Society's publishers, Messrs. Bell and Daldy, Fleet-street. Price Sixpence.

SPECIAL PRIZE.

A Prize of Twenty Pounds (placed at the disposal of the Council for this purpose by the Rev. F. Trench and J. Macgregor, Esq.,) and the Society's Silver Medal, is offered for a Writing-case suited for the use of Soldiers, Sailors, Emigrants, &c. The attention of those intending to compete for this prize is directed to the following points, which will influence the Council in making their award :—

Lightness,
Smallness of size,
The avoidance (if possible) of fluid ink,
Durability,
Cheapness, with a guaranteed supply, and
General applicability to the duties, habits, and requirements of the above classes.

The articles sent in for competition must be delivered at the Society's House, Adelphi, London, W.C., on or before the 8th May next.

EXAMINATION PRIZE FUND FOR 1858.

The following circular letter has been addressed to the Members of the Society :—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C., Jan. 30, 1858.

Sir,—I am instructed by the Council to inform you that the Examination Prize Fund for 1858 is now opened. The donations for 1857 were contributed by twenty-three Members, and there is a small balance to carry forward.

The Council draw attention to the fact, that last year's Examinations were limited to two centres. At these two centres, pupils from thirty-seven Institutions only presented themselves; ten of them were from the metropolitan district, London being one centre; sixteen from Yorkshire, Huddersfield being the second centre, leaving but eleven for all England, Ireland, Scotland, and Wales. This unequal distribution was one of the reasons which satisfied the Council that the system was not adapted to meet the wants of all the Institutions. They, therefore, resolved to bring the Examinations to the very doors of the Institutions, by such step of course throwing open the prize fund to the students of every Institution.

The Council have also decided on contributing a certain mileage towards the travelling expenses of those candidates who desire to receive personally and publicly their prizes, and also £5 towards the travelling expenses of each pupil, who, obtaining three of the Society's certificates of the first class in the subjects contained in the Oxford programme, is desirous to contend for the degree of Associate at the Oxford Examinations. These changes lead the Council to believe that a considerably larger sum than last year will be required for the prizes, and I am, therefore, instructed to draw the attention of all the members to the circumstances.

Donations can be remitted to Mr. Samuel Thomas Davenport, Financial Officer, Society of Arts, Adelphi, London, to whom Post-office Orders should be made payable.

I am, Sir, your obedient servant,
P. LE NEVE FOSTER, Secretary.

The following is the list of Donations up to the present date :—

T. D. Acland	£ 5	5
J. G. Appold	10	10
Harry Chester	10	10
C. Wentworth Dilke	10	10
Lord Ebury	5	0
J. G. Frith	5	5
F. Seymour Haden (annual)	2	2
Edward Highton (annual)	2	2
The Marquis of Lansdowne	20	0
Sir Thos. Phillips	5	5
Arthur Trevelyan	1	0
T. Twining, jun.	10	10
Dr. J. Forbes Watson	1	1
G. F. Wilson, F.R.S.	10	10

FIBRES FROM CEYLON.

Samples of Fibre from Ceylon have been received by the Society, through Messrs. Frith, Sands, and Co., and the following is the broker's report thereon :—

Nos. 1 and 2. Pine-apple Fibre, good colour and fine fibre, rather short; if available for spinning on flax machinery, which it apparently is, it would be worth £56 or £60 per ton.

No. 3. A longer, softer fibre, but not of such good colour. Value about £55 per ton.

No. 4. Plantain Fibre, of fair colour and length, suitable for mixing with Manilla Hemp. Value, £28 or £30 per ton.

No. 5. Coir Fibre, clean, even, of good colour, and strong; if a parcel were landed as good as this sample it would realize £35 per ton.

The samples may be seen at the Society's house.

THE *BOMBYX CYNTHIA.*

The following communication has been received from the Colonial Office:—

Downing-street, 29th January, 1858.

Sir,—I am directed by Mr. Secretary Labouchere to request that you will lay before the Council of the Society of Arts a copy of a despatch from the Governor of Malta on the subject of the *Bombyx Cynthia* silkworm.

I am, Sir, your obedient servant,
HERMAN MERIVALE.

The Secretary to the Society of Arts.

(Despatch referred to.)

Palace, Valetta, December 22, 1857.

Sir,—In 1854, I made several reports on the *Bombyx Cynthia* silkworm, which feeds on the castor-oil plant, for the information of the Society of Arts. It had been introduced into Malta from India in that year, and appeared both hardy and wonderfully prolific, yet it failed in Malta in 1855.

2. I had, however, previously distributed a great number of eggs, by sending them to Italy, France, and Algeria; and I continued to watch the accounts of the trials made in those countries. I found that it had spread there, and had been carried to Spain and Portugal, and was creating considerable interest wherever it had been tried.

3. I was therefore induced to re-introduce it into Malta. At the end of July last, I received a few eggs by post in a quill from Paris, and these have multiplied in an extraordinary manner, so that I have not attempted to have them counted. The temperature of the winter season, now in December, seems, however, to be affecting them even in Malta, inasmuch as they grow more slowly than they do in summer, but, nevertheless they appear healthy.

4. A very interesting paper on the progress making in different countries in rearing the *Bombyx Cynthia* will be found in the last number of the papers of the French Société d'Acclimation. This paper is by the able President of that Society, M. Geoffroy Saint Hilaire.

5. I had, in 1854, successfully sent the insect to the West Indies. The French Society have sent it to Brazil, to the Southern United States, and into Egypt. It is being introduced into Germany, and we are now sending more eggs and worms from Malta to Sicily.

6. Experiments are making in France on spinning the silk, which is found to be very fine, very strong, and to take dyes well. In France, the cocoons are carded and afterwards spun, as in Malta. It is said that the chrysalis, on extricating itself from the cocoon and becoming a moth, does not, as was supposed, cut the thread; and the French have partially succeeded in unwinding the cocoons.

7. The great interest I find taken in other countries in the attempts making to naturalise the *Bombyx Cynthia*, has induced me to report to you its re-introduction into Malta, with the view of begging you to make this known to the Society of Arts. I enclose an extract from my despatch, dated 7th July, 1855, which explains the manner in which I successfully sent the insect to the West Indies, and in the same manner it may be easily conveyed from any one country to another. It may be found difficult to preserve this silkworm throughout the winter season, as well as difficult to grow the *Ricinus*, its proper food, in the climate of Europe. The proper climate for the *Bombyx Cynthia* is within or on the borders of the tropics. But the attempts now making ought not to be the less encouraged on that account, for they are producing a new raw material for thread and clothing within reach of men of skill and science, and 127,000 cocoons have recently been sent from Algeria to be manufactured in Alsace.

8. The extraordinary manner in which the *Bombyx Cynthia* multiply, together with the abundance of food for them, produced without culture in warm climates, renders the study of the habits of this insect and the nature of its cocoons of considerable importance.

9. I send herewith a small sample* of the cloth made from worms reared in Malta.

I have the honour to be, Sir,
Your most obedient humble servant,
WILLIAM REID, Governor.

Extract of a Despatch from the Governor of Malta to the Secretary of State. No. 83, dated 7th July, 1855.

* * * * *

6. It may be useful to state how the *Bombyx Cynthia* was successfully transported from Malta to the West Indies, after many attempts to bring it from India to Europe had failed.

7. Having first obtained the authority of the directors of the Peninsular and Oriental, and of the West India Royal Mail Steam Packet Companies, about 30 fresh cocoons were placed in bird cages, and suspended in the cabin of the surgeon of the steam ships. This was done that males and females might be kept together when the chrysalides became moths. In the moth state they required no food. On the voyage they laid their eggs, and these eggs began to hatch on their arrival at the Island of Grenada in the West Indies.

NINTH ORDINARY MEETING.

Wednesday, Feb. 3, 1858.

The Ninth Ordinary Meeting of the One Hundred and Fourth Session, was held on Wednesday, the 3rd inst., the Right Honourable the Earl of Shaftesbury in the chair.

The following Candidates were balloted for and duly elected members of the Society:—

Everett, Frederick William
Gray, Capt. William, M.P.
Herapath, Spencer
Laxton, Henry
Rock, Thomas Dennis
Williams, Alexander
Woods, Nicholas

The Paper read was:—

ON HOUSE ACCOMMODATION—ITS SOCIAL BEARING, INDIVIDUALLY AND NATIONALLY.

By Robert Rawlinson, Civil Engineer.

The paper now brought before the Society, is intended to direct attention to houses as they have been, to houses as they are, and to houses as they ought to be. The house accommodation of the masses will be principally considered, some of its defects will be pointed out, some of the resultant evils will be described, and certain suggestions for means of improvement and of sanitary regulations will be made. The question of house accommodation is far too comprehensive to admit of full discussion in the time allotted to one evening; and, therefore, disappointment may be felt that some particular branch of the subject has not been dwelt upon.

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* This sample has been received, and may be seen at the Society's house.

House accommodation and house construction have received the attention of His Royal Highness the Prince Consort, and also the attention of many noblemen, gentlemen, and ladies, who have followed the good example set them. "Model houses" and "improved cottages" have been erected by societies and by individuals, with beneficial results most encouraging. To remedy all existing defects in houses of the poor in such manner, is, however, too much for isolated individual enterprise, and far too vast even for a free government. How, then, must the work be done? I will not attempt to give a full answer, but will content myself with pointing out some of the existing evils, and with shewing how widespread these evils have been, and now are, and then briefly indicate a few practical remedies. Improvement must, I consider, consist in inspection, and in regulation, by the local authorities, wherever neglect, filth, and disease exist.

Particular plans of improved cottages will neither be described nor recommended, not because their appropriateness and advantages are not recognised and appreciated, but simply because there is not time to discuss the whole subject. I may be asked, "Why, then, open up the question?" My answer is, that in this great and free Christian country, knowledge must precede beneficial change, and to inculcate the necessary knowledge there must be "line upon line, precept upon precept." Many good and able men have spoken and have written upon "the habitations of the poor," and many more good men must speak, must write, and must act, before the work will be even hopefully initiated. The question is one of health, of morals, of religion, and essentially one of national safety. If, as a nation, we will not work from higher and more Christian motives, our selfish fears may, in time, prevail. The health and life of a nation are in the masses.

A celebrated writer has said, if he might "write the songs of a people, he cared not who wrote their laws." I would say, "if I might house the people I care not who writes songs, or who enacts laws." Good citizenship is not from without, but from within. If men and women learn immorality from their birth, and in their homes are surrounded with vice as with the atmosphere, of what practical use can any secondary means prove? National schools, national reformatories—private schools and private reformatories—must alike fail. Gaols do not improve the morals of criminals, but notoriously render them worse. Gaols are actually looked upon by many criminals with favour, and not with dread. Cottages are not so clean, nor so airy, nor so warm, nor so healthy, nor so comfortable as prison-cells. I do not say "neglect the gaols," but I do say "look to the cottages, to the birthplaces, the homes, the true schools, and the only practical reformatories for the poor."

Historic Sketch of Houses.

The earliest form of protection for the human body from the effects of climate, would most probably be a "gourbie" or a tent. Caves would only be resorted to after crime had induced personal fear, and rendered seclusion necessary to personal security. The tent of the Arab is, to this day, as were the tents of the patriarchs. Types of house-construction may probably be found, in use, in one part of the inhabited globe or another, which faithfully represent every contrivance for shelter either invented or appropriated by man, from the burrow of the bushman to the "solemn temples" and "gorgeous palaces."

Invention and progress seem to be confined to a few of the many races of men, and progress, with permanence, has, so far as we know, as yet been the lot of none. The much-vaunted Anglo-Saxon race is only on its trial—and, if Lord Macaulay's prophecy should come true, we know its fate. Look abroad over the wide and fruitful regions of the earth, and we shall find retrogression in vast masses of the population, or superstitious forms stereotyped. As the Chinese were in ages past, so are they now. Throughout the East, generally, we find desolation or barbarism where civilization once reigned.

In these regions, from the earliest periods of history, and under every form of government, we find that the masses of the people have been badly housed, and hence have occurred plagues, pestilences, misery, and premature deaths. The history of man, with few exceptions (the Jews, Egyptians, Romans, &c.), down to the present time, is indeed one of neglect of sanitary laws, and consequently of retributive punishment. The Registrar-General points out weekly, quarterly, and annually, the national mortality, indicating the preventible excess, but, so far, to little practical parochial or municipal purpose, as compared with the work required to be done. Ignorance is fenced round with selfishness; the desire is to protect property and pocket; the results are ruin to property, and to health, and morals; the sacred name of freedom is invoked to perpetuate a state of things which breeds vice and engenders crime. An *Englishman's* house is said to be his castle. When Englishmen learn to keep their castles (that is, houses) so as not to destroy their own health, and render themselves, their wives, and their families a burden to the community, they may be left alone; but a man cannot be allowed to keep at large a savage dog, or a mad bull, to worry, to tear, and to gore the public. Why, then, should any man be allowed to generate and let loose typhus, small-pox, and other analagous diseases, to disfigure and to destroy? Lord Shaftesbury, by his Common Lodging Houses Act, has given the means to prevent disease, and to diminish immorality, wherever the Act is put in force, and the beneficial results are acknowledged alike by landlord and by tenant. Let there be such power of inspection, wherever contagious diseases break out, whether the house be that of a rich man or that of a poor man, and the results will be a benefit to all. Several towns have had public and private works of sewerage and drainage carried out with most marked beneficial results. But back streets, courts, and alleys remain neglected, room tenements and cottages (not common lodging-houses) remain overcrowded, unventilated, filthy, and breeders of fever. The parish authorities can only relieve distress brought about by preventible disease; they cannot, or they do not, remove the causes of the disease.

Houses as they have been and Houses as they are.

Central Asia—the birth-place of truth and of myth—the cradle of history—the land of contrasts—presents us with the oldest type of human dwelling; and what do we find but, side by side, the most wretched hovels and the most luxurious palaces? In the hovels we find the Arab-Egyptian (the Fellah), the "Ryot" of Hindostan, and the swarming masses of China, who all fare badly. A hut of mud, a roof of thatch, a floor of filth, hovel and clothing abounding with parasitical vermin, where skin diseases, ophthalmia, along with other analagous complaints prevail. From generation to generation there has been, and there continues to be, the greatest amount of misery to the greatest numbers. The tropical sun shines down upon filth, upon squalor, and upon disease. The vulture, the stork, the dog, and the hog scavenge the streets and suburbs as of old; and at a glance you may see that the existing dog of an Eastern city is a lineal descendant of those dogs which licked the blood of Ahab, and ate the carcase of Jezebel beneath the wall of Jezreel. Plague ever broods over these sites, and cholera sows its subtle but death-producing seeds in the face of the sun, to be wafted wide as the atmosphere, to kill wherever there is degraded man, living amidst filth, foul-air, and wallowing in sin.

The Russian serf is miserably lodged; the habitations are of rude materials, are primitive in form, and wretched in accommodation. Over the continent of Europe, generally, the poor are lodged in mere hovels, with defective means of sunlight, with defective means of ventilation, and filthy alike internally and externally. Examine the tenements of Germany, of Denmark, of France, of Italy, of Portugal, of Spain, and of the other kingdoms, and you will see the appropriate residences of ignorance and superstition; the fitting birth-places of wild turmoil and anarchial revolution.

But, as Englishmen, let us look nearer home,—let us blush and sorrow over the mud-hovel of Ireland, the "boothie" of Scotland, the country cottage, and the room-tenement of England. I have seen these places, and have witnessed sights I cannot describe, and human misery the pen fails in power to depict. The story of this source of national deterioration has been told recently by many able men, as may be found in despised blue-books, and in literature not popular.

If we look to our mediæval history we find that our cities, towns, and villages, for the most part, were composed of hovels with mud-walls and with thatched roofs. Mud floors were covered with rushes or straw, which remained until the compost was rotten to corruption. Houses were without order or regularity. Streets, in cities and in towns, were narrow, dark, and tortuous; the subsoil was without sewers and drains; the streets were without pavements or lights. Dogberries watched but did not ward, bravoes stabbed, burglars plundered, and nimbler thieves "cut purses." The only remedy known to the magistrates consisted in loading gibbets, and in "stringing sturdy rogues to the gallows apace."

Time rolls on, and "merry England" grows into the improved state depicted in Swift's "City Shower." Parts of cities and towns had then pavements and surface gutters, but no sewers. There are now pavements, sewers, cleansing, lighting, and watching more generally; but many a poor man's cottage, and many a room tenement receive no adequate benefit. There is scarcely a city, town, or village in Great Britain in which there are not to be found some houses and some rooms into which the sun seldom shines: into which a breath of fresh air seldom blows. There are courts closed all round; alleys not two yards wide; rows of cottages, back to back; rooms without window or flue; cellars, with ceilings below the level of the ground; attics in which a child cannot stand upright, and inhabited human dens too foul for wild beasts' lairs.

There are many reasons for the utterly degraded state of this portion of our poor. Centuries of neglect and of seasoning have blunted the natural senses to the taint of foul air; as, most frequently, the only industry shown is to block out fresh air, to secure heat—and when we find thousands of men, women, and children in our towns, barely covered by a few filthy rags, inhabiting rooms without furniture, lying on rags, or on tainted straw, with no adequate food, and no certainty of a second meal, except by begging or by stealing, we should judge their ignorance of sanitary laws lightly, and deal gently with their transgressions, as most of these poor creatures never had a chance given to them of knowing better or of being better. They cannot build houses, they cannot furnish a single room, however small; they cannot understand the laws of nature; they cannot appreciate oppressive sanitary rules, when arbitrarily enforced. They are hungry, and wish to eat; they shiver in the cold, and wish for warmth; they are exposed to the bitter elements of a severe and varying climate, and they wish for shelter. A living body is warmer than a naked wall or bare floor, and hence overcrowding is considered a desirable thing. They feel and appreciate the warmth, but do not see the subtle poison; and, in fact, the carbonic acid deadens the senses, and induces oblivious repose.

The reports drawn up by the Inspectors of the General Board of Health and others detail case upon case of defective house, and of improper room, accommodation. I could add proof upon proof, from personal inspection, of the discomforts, sicknesses, and miseries endured by the poor who reside in cellars, damp, fœtid, and dark at noonday; or who huddle together in room tenements which are without furniture, the floors rotten, the walls blackened with filth, the ceilings hung with webs of spiders, and out of which rooms fresh air is, as much as is practicable, excluded. There are the rubble walls of the north, the porous bricks of the midland counties, the "cob" walls of Devonshire, and the rotten timber and shingle of some of our seaports. Out of these places proceed fevers; and upon them settles cholera. Into them goes the parish money, as the relieving officer and the parish surgeon cannot long be absent. The rent is paid by the parish many times over, and not unfrequently more than the purchase money is expended in one year. There are room-spaces, of the most wretched class, which annually cost a parish more to maintain than any equal area in Windsor or in Buckingham Palaces.

The Registrar-General has stated that the tendencies of modern civilisation, in this country, are to mass men into towns. In 1841, the population in 117 districts, comprising the chief towns, was 6,612,958 souls. In 1851, in the same districts, the number was 7,795,882, being an increase of 1,182,924 in ten years, or about 18 per cent. There is a corresponding increase in the rates of mortality, although in some cities and towns there have been many sanitary improvements. As towns increase, there is an engulphing or lowering of whole streets and of entire districts of houses, built originally for the merchant and superior tradesman. Examine some of our great sea-ports and inland manufacturing towns, and it will be found that streets of houses originally erected for "the merchant princes" are now in ruins. From having been the abodes of those possessing wealth, they are now the abodes of the improvident, of the vagrant, of the vicious, and of the unfortunate. The quaint carving on the stone-work looks out of place, the walls are half in ruins, the gables are shattered, and foul weather-stains of damp blotch the surface. Within, matters are even worse; the rooms are now divided and sub-divided on every floor; the staircase is darkened, its massive hand-rail and carved balusters are crippled and broken, the once firm stairs are now ricketty and dangerous; the stucco-finished plastering is blackened and in holes, the dusty and rotten laths being in many places bare; the landing-windows, when the space is open, have neither frame nor glass, so that the rain drives in right and left; make-shift doors lead into small spaces let off as separate tenements. The narrow space of street betwixt the houses is further contracted by rude looking poles rigged out of windows on either side, story above story, on which clothes are hung to dry; thus, externally, a free flow of air is impeded, and an atmosphere, usually very damp, is made more so. In the same street houses may be found which were erected in Queen Elizabeth's reign, with others of more modern date; the walls are of hewn stone, of bricks, of timber framing, of limestone rubble, or of other material. Some have been plastered, and others have been covered with slates; some have plain vertical fronts, and others project at each story. Out of these streets covered passages lead into still narrower, dirtier, and more crowded courts. In many instances the ground rises abruptly, and slippery half-worn steps lead to houses more ruinous and more crowded than those fronting the streets. One privy serves for a whole court, and this is usually filthy; the cesspool full, overflowing; the fœtid refuse stagnant over the surface. An external stand-pipe, the water on only for one hour in twenty-four, supplies water to an entire court with many tenants; tubs, mugs, pots, pans, and troughs, being placed in yards, on stair landings, or in the filthy rooms, to absorb all the deleterious gases of the places. Within the furniture accords with the premises; it is old, rotten, broken, and ruinous. One room serves for a family of father, mother, and children, not unfrequently grown up sons and daughters. Dogs and fowl inhabit the same small apartment, and in some instances ten human beings. In gaol each criminal has, at the least, one thousand cubic feet of fresh air secured, and the air in this space is regularly, evenly, and many times changed during each day. The inhabitants of room tenements, of country cottages, of Scotch boothies, and of similar places, have frequently not one hundred cubic feet of air space, and this air is never changed, but by the natural law of diffusion of gases, the deleterious carbonic and sulphuric acids are allowed to perform their fatal work.

There are many defects in old and in modern villa and suburban houses, such as improper site for detached houses, in the country or in the suburbs of towns. The site may be a swamp, an undrained hill side, or even a hill top. The sewerage and drainage may be defective; the plan may be confused; the rooms may be too low; the doors, the windows, and the fire places may be improperly placed; and means for ventilation may have been entirely neglected. The pump and the cesspool may communicate, and pipes, and gutters, and cisterns of lead, may add that deleterious metal, in solution, to the water used for domestic consumption. There are few country or suburban houses, even of the better class, entirely free from some one or more of these defects, no not even the mansions and palaces.

Having glanced at houses as they are in courts, in lanes, in alleys, and in the back slums of towns, and at some of the defects of those in their suburbs, we will now look at some houses as they are in the country throughout Great Britain.

COTTAGES.

Look at these structures called cottages. They are mere hovels of mud; or of "wattle and daub;" or of rubble stone set in mud; or of rude timber frames filled in with mud, or with brick, or with stone, or with other material. The timber is rotten; the mud, bricks, and stones, are damp in wet weather, and dusty in dry weather. Look at the site; probably a hole; not unfrequently a swamp several feet below the adjoining road, the slope being towards the door. If on an elevation, the ground is unformed, rugged, abrupt, uneven, and neglected. Many of these hovels are only one story in height, the side walls are very low—from three to six feet up to the square—few are vertical and some are supported by buttresses or by props. Many are half-buried against a hill side, or against a bank which is wet.

Then the roof. This is thatch of heather or of straw; or is formed of turf, of sods, or of shingle, of tile or of slate. If of thatch, the material is rotten with age, and green with fungoid vegetation; if of shingle, the timber is decayed; if of slates or tiles, they are broken and in holes. Doors and windows match the structures, and the floor is native mud, the space enclosed being common to bipeds and to quadrupeds alike. The floor is not only very dirty, but the walls, roof, and furniture are the colour of grimy dirt. Amongst the rafters, spiders and other insects abound. Outside, animal refuse is stored in some hollow where liquid permanently rests, so as to keep up evaporation and an evolution of gases, highly injurious to human life, and if this refuse does not actually surround the hovel, it is frequently so situated that the prevailing winds shall drive the gases of decomposition into and through the habitation. The arrangements for disease, misery, and premature death are ample, adequate, and complete. The hovel is crowded by males and by females of all ages, without means of separation, so that the arrangements for sin and misery are also complete. Morality is consequently at a low ebb. How can it be otherwise? Look at the country in which these hovels are situate. There may be the grand old mountains of Wales, fragrant with heather and wild flowers; there may be the glorious lake scenery of Cumberland; or there may be the graceful undulations of the midland counties, agriculturally rich beyond the romance of fable,—trees, corn-land, and grass-land blending harmoniously; or we look over the wolds of the chalk and oolitic district, open in broad rounds and valleys, dry and comparatively bare of trees, but, nevertheless, yielding rich herbage and fine crops. Such hovels as I have faintly attempted to depict may be found in landscapes such as I have most imperfectly attempted to describe, but the houses are neither ornamental nor useful, although artists persist in designating them picturesque. There are not only agricultural hovels, but there are sea-side fishermen's hovels, and out-of-the-way miners' hovels. They are, however, all of one type, and are too frequently nests of filth, of foul air, of sickness, of immorality, of human degradation, and of human sorrow. The parish doctor knows the inhabitants; they consume his time and his physic. The relieving officer knows them—they empty the public pocket. The parish constable knows them—they are his most turbulent customers. The gamekeeper knows them, as frequently they are poachers. The magistrates know them—they commit petty thefts, and produce bastardy cases innumerable. The minister of religion knows them, as most assuredly amongst these people his principal work lies. The charitable know them—ladies, beautiful, delicate, and good, visit, sympathise, and relieve.

"Hovels, and their inhabitants, as they are," such as I have tried to describe them, are known and they are unknown. They are known to artists, to parish surgeons, to constables, to gamekeepers, to some clergymen, and to benevolent ladies, but they are, for the most part, unknown to parish guardians, to town-councillors, to country squires, to imperial legislators, to the general public, and to very many landowners. By some landowners their existence is considered to be an incumbrance. Cattle have value for such persons, but not human beings.

SCOTCH HIGHLAND AND ISLAND BOOTHIES.

The cottage, boothie, or hut in Scotland is a barbarous shelter. Many of those in the highlands and islands are mere hovels, rough in the materials used, and rude in the form of construction. The side walls and gables are of dry rubble stone, peat, or mud; the covering is thatch, mud, or sod, often a jumble of material, plastered, piled, weighted, or tied on. The door is low; a mere hole serves for window; and a hole in the roof lets out a portion of the peat fire smoke. There is no flue, and, consequently, when the fire smokes, there is a general distribution of smoke with the heat, so that a philosopher may study the law of "diffusion of gases" visibly. Smoke not only rises through the hole specially left for its escape, but pours out of door, window, and also out of every crack and cranny in roof and side wall. A stranger might easily imagine that the boothie was on fire, or mistake it for some charcoal burning apparatus or kiln. The inside of one of these boothies is a curiosity. There is an attempt at division, and beds are made up in recesses of the smallest dimensions against the damp walls or bank, and closed in by the aid of peat, hurdles made of heather, or some equally rude contrivance. If there are ceiling joists, a loft is made in the roof, to be reached, not by stairs, but by a ladder, and this may be a general store or a bed-room. Most frequently the natural earth—be it rock, mud, or peat, forms the floor, full of holes, worn and uneven. Pavements may be found of rude flags or pebbles, or a mixture of both. Many boothies give shelter to cattle and other animals which man retains for his use—quadrupeds and bipeds—such as dogs, pigs, ponies, ducks, fowls, &c. They may enter all by one door, or there may be a separate entrance under one roof. Inside and outside these places there is dirt and neglect. The very spirit of thrift could not, in fact, keep such places clean. Smoke is as the breath of life to the residents, damp and dirt an institution.*

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* Up to the early part of Elizabeth's reign, cottages in England generally consisted of a single room, and chimneys were unknown in such dwellings. Up to the end of the 13th century,

We censure the poor for their indulgences, but what says that close observer of human nature, Sir Walter Scott. Listen to the antiquary and the village fish-wife, after the bargaining for the fluke and the cock-paddle.

Monkbarns says:—

"Half-a-crown, then, Maggie, and a dram."

"A weel, your honour maun hae't your ain gate, nae doubt, but a dram's worth siller now, the distilleries is no working."

"And I hope they'll never work again in my time," said Oldbuck.

"Ay, ay,—it's easy for your honour, and the like o' you gentle-folks, to say sae, that hae stouth and routh, and fire and fending, and meat and claith, and sit dry and canny by the fire side,—but an ye wanted fire, and meat, and dry claise, and were deeing o'cauld, and had a sair heart, whilk is worst ava', wi jist tippence in your pouch, wadna ye be glad to buy a dram wi't, to be eilding and claise, and a supper and heart's ease into the bargain, till the morn's morning?"

Charity is inculcated in the Scriptures; and it must not be denied that charity is necessary to Christianity. But there are many forms of false charity, and some of these forms are demoralising. It is not charity which leaves a labourer and his family in some wretched cottage or hovel to contract and to endure fever, and then relieves him with wine, jellies, and similar delicacies. It is not charity to allow the poor man's home to be all discomfort, so that the ale-house leads him from bad to worse, until a gaol receives him from the esquire's sentence, and then for the esquire's lady and daughters to carry or to send relief to a broken-hearted mother and starving family. Soup-kitchens, charity bazaars, money clubs, clothes clubs, dispensaries, and personal visits to distribute money or food, are not to be denounced; but they should all be secondary, and not primary; the duty of the rich is to help a poor man to help himself. Firstly, by providing comfortable and healthy homes; and, secondly, by living such a life as shall be a good example: a clean, well-ventilated, and well-drained cottage, with good water, and a small garden, at a moderate rent, should be provided for all. A case of fever should lead to an immediate inspection, and to immediate sanitary improvement; other forms of relief may then be consistently offered. It is a mockery, if not worse, to allow a man to inhale poison, and then to offer him sympathy: intoxicating drinks and delicate food do not cure fevers, but fresh air and wholesome water, with plain food, well cooked. Promote means of health, promote means of industry, and promote habits of forethought and habits of economy; add to this relief to the aged, and especially the afflicted, that blessings may rest on the giver and on the receiver. Many richly endowed charities are a perpetual curse; many so-called charitable people sow the means of vice broadcast; schools, churches, union workhouses and gaols, will neither cure nor even reduce the evil; there must be the means of health and comfort, with a chance of virtue, in every British home before men can be Christians.

VENTILATION OF HOUSES.

Many volumes have been published on the subject of ventilation, and many patents have been granted for apparatus to effect ventilation; and yet, one of the evils most common, both in public and in private buildings, is defective ventilation. How is this? The nature and properties of the atmosphere have been accurately described over and over again, and correct means of ventilation are lucidly set forth by more than one author,—from Count Rumford to Dr. Arnot; but, somehow or other, the right knowledge does not get into the right heads,—hence all the neglect or blundering, all the mischief, and all the consequent misery and inconvenience. With the wheat of knowledge there is a vast amount of the chaff of ignorance and of advertising quackery. Architects and builders must be very young birds indeed, if they are caught by the chaff—in nine cases out of ten, if they are caught at all. But the truth must be told, namely, that few architects make ventilation a special study, and they consequently neglect alike both wheat and chaff; ventilation has not been "in the bond;" they design and build a house, having doors, windows, fireplaces, and chimneys; but there is no warranty given that the rooms shall have full and free means of ventilation, independently of doors, windows, and ordinary chimney-places, or even that all the flues shall draw. Will it be improper in time to come to ask for such warranty? All rooms ought to be ventilated,—all chimneys ought to draw. The task may be difficult, but it is not an impossible one; smoke obeys the simple law of nature under all circumstances, and on all occasions; it never comes down, when it ought to go up, without good and sufficient reason; if there is fault, it is in the building or in the architect, and not in the smoke. It may be pardonable to attempt once more, probably in a more bungling manner, that which has been so often and so well done by some of the great men alluded to, viz., to explain some of the properties of the atmosphere.

Air is a substance highly elastic, but, under equal temperatures, its bulk and gravity are tolerably permanent.

Heat expands air, causing it to occupy more space, and hence heated air is lighter in proportion to the heat imparted to it.

Warm air, being lighter, rises into and through colder air; and cold air, being heavier, descends into and through warm air, that is, the warm air in a room and chimney rises into colder air outside, and there is a tendency in the cold air to descend into the warmer air of the room, even down the chimney, if the balance of the draft is not in favour of an upward current. When rooms contain air several degrees of heat above the external atmosphere, this colder and heavier external atmosphere presses in to restore the balance, through every chink and opening; hence the cold drafts experienced in winter.

To maintain combustion air is necessary; hence the abstraction of air by all fires, and the necessity of chimney-flues to remove the heated products of combustion.

All rooms are reservoirs of air; they contain so many cubic feet, according to their dimensions. A room 10 feet long, 10 feet broad, and 10 feet in height, contains 1,000 cubic feet of air, at all temperatures, neither more nor less. But, as air is expansive and is expanded by heat, 900 cubic feet at a low temperature may be heated until they are increased in bulk to 1,000 cubic feet at a higher temperature. In this case, as there is one-tenth less of substance, there is also about one-tenth less of weight, and one-tenth less of the chief ingredient to nourish life. The warm air is one-tenth lighter, but in each case the room is full of air.

For the sake of illustration, we will compare the *room* full of air to a cistern full of water (though water is practically non-elastic). Then, to maintain either a room full of air, or a cistern full of water, if provision is made for drawing out (or abstracting like a chimney-flue), provision must be made for letting in. If doors and windows fit tight, and there is no other means of admission, it will be practically impossible to abstract air by the fire and chimney-flue from a room for any length of time. The operation could not go on for an instant, but by reason of the elasticity of the atmosphere. Few rooms have doors and windows, walls, floor, and ceiling perfectly air-tight, and hence a fire is burned at the expense of cold drafts, wherever external air, in winter, can find entrance. This is generally under the door, through the skirting and floor, and so along to the fire-

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castles (or baronial dwellings) were literally fortified places, in which the convenience of habitation was sacrificed to purposes of defence. It was not till the 15th century that barons resigned the security and gloom of their castles for the comparatively greater comfort and convenience of castellated houses.

place. Who does not suffer from cold feet in winter, especially during frosty weather?

Small rooms, having less air to pull upon expansively, frequently smoke by puffing down-drafts in the chimney. The fire forces air up the flue, until the air is too highly rarified, and there is practically a partial vacuum; cold air then descends the flue to restore the balance, forcing some of the heated air and smoke with it. Large rooms, as a rule, are more easily warmed, and are freer from draughts than small rooms.

There is one form of evil connected with houses, namely, the admission of foul gases from sewers, drains, or cesspools, which, being unseen, may remain unrecognised, although much sickness and many premature deaths may occur in consequence. At all times when the internal temperature of any house is higher than the external air, there is an active exhaustion caused by the fires up the chimney, and there is a drawing or pumping power within the house, and sewer and cesspool gases are drawn in from every crack and from every cranny. The mischief of such a state of things is very great. In forming sewers and drains, this contingency should never be lost sight of. Defective sewer and drain connections are a source of mischief both winter and summer, as in winter the foul gases are drawn in, and in summer sewer gases (sulphuretted hydrogen) and others, which are lighter than common air, flow in. Many persons think that houses situate on a hill, or having a rapid fall for the drains and sewers, must necessarily be easily drained, this is a mistake; there must be special and ample provisions for external ventilation from the sewers and drains, or the gases from lower levels will flow up and into such houses. Water, by reason of its weight, which is greater than atmospheric air, flows down hill with velocity proportionate to the slope and to the friction; sewer-gases, by reason of their gravity, which is less than atmospheric air, flow up-hill with velocity also proportionate to the slope and to the friction. It is of the utmost importance that these facts should be remembered.

There is the law of "diffusion of gases," by which gases diffuse throughout other gases and throughout atmospheric air. If this law were annihilated, the present order of animal creation must cease to exist. It is the diffusion of gases which renders a hut, boothie, cabin, room, common lodging-house, or modern drawing room, tolerable during excessive crowding. The poor over-crowd their wretched apartments partly from ignorance, but more from stern necessity. The wealthy crowd a modern drawing-room partly from ignorance, but more because it is fashionable. The mischief is alike fatal in both cases. At a dinner table we have our plates and knives and forks changed, and use separate glasses for purposes of drinking, but in a crowded drawing-room, and in a crowded ball-room, we breathe and re-breathe the waste products of our own and of each other's lungs, vitiating and re-using the air in common, a process far more injurious to health than using plates and glasses in common. Ventilation, free and abundant, should, in all cases, be provided for. But no amount of ventilation will do away with the evils of overcrowding. An overcrowded hovel, or an overcrowded drawing-room, is only an evil in a lesser degree, if even their ceilings and their roofs could be removed.

The following extracts from Reports by the Inspectors of the General Board of Health will give some idea of the sanitary condition of the dwellings of the poor in the towns named.

The supplement to the report on Whitehaven, dated 1849, contains tables of the "room-tenements" and "cellar-tenements" within the district, and states that "the buildings are in a ruinous condition; the staircases are of wood, frequently dark, confined, and rotten or out of repair. Where the beds are described as 'old and dirty,' they are upon bed-stocks, but very few of them have anything to cover them with but a bundle of old rags. Those beds, named 'rags and straw,' are on the floor without bed-stocks, and without proper bedding to cover them with; the bed-clothing, if any, a bundle of rags. Many of the rooms are swarming with vermin; disease and fever prevail throughout."

Out of 315 room-tenements, inhabited by 1,369 persons, there are 256 described as being without means of ventilation. The beds in 83 of these tenements are composed of "rags and straw," and nearly the whole of those in the remaining tenements come under the headings of "dirty," or "old and dirty."

Out of 191 cellar tenements, occupied by 716 persons, not less than 177 are stated to have no means of ventilation. "They are damp and dirty to a degree not to be described; a heap of dirty straw or rubbish constitutes the only form of bed in most cases, and this is laid on the damp floor in one corner. The confined smell and fœtid atmosphere are most offensive, and almost suffocating to any person entering. They have no privies, or convenience for ashes, but the inhabitants get rid of their refuse as they best can, most frequently immediately in front of their door." It may be added that 12,000 of the inhabitants, or two-thirds of the entire population, were, at the date of the report, without any privy accommodation.

In the report on Gateshead, speaking of the dwellings of the poor, the Inspector says,—

"Neither plan nor written description can adequately convey to the mind the true state and condition of the room-tenements, and of the inhabitants occupying them. The subsoil on the sloping side of the hill is damp, and most foul; the brickwork of the buildings is ruinous, the timber rotten, and an appearance of general decay pervades the whole district. The buildings, originally erected as residences of a superior description, have single rooms let off as tenements, which are crowded with men, women, and children; the walls are discoloured with age, damp, and rot; the windows are broken—old rags, straw, and boards, occupy the place of glass, so that means of light and ventilation are alike absent. There are no sewers nor drains, neither is there any proper (privy) accommodation; solid filth encumbers the surface; liquid refuse saturates the subsoil, and is drawn by capillary attraction through the porous bricks up into the walls; personal cleanliness or a healthy atmosphere is impossible."

In the Report on Dover, the following evidence of the relieving officer of the district is given:—

"The largest proportion of out-relief distributed in the worst portions of the district is caused by fever, small-pox, and other similar complaints, such being very prevalent in these localities; caused, I have no doubt, to a very great extent, by the closeness of the buildings, and their filthy state, from want of proper drains and other sanitary regulations.

"From the experience of upwards of ten years' intimate connexion with the poorer classes, I have not the slightest hesitation in affirming that there is a most decided direct connexion betwixt confined districts, bad sanitary arrangements, and poverty and vice. In the worst districts the moral state of the inhabitants is most deplorable,—as the youth from these places grow to manhood they become habitual thieves or paupers; brought up to no regular employment, grossly ignorant and reckless, their time is spent between the gaol and the union workhouse. I can only say that if the Government wish to prevent the increase of a most debased and vicious population, they will take measures, if not to sweep away these nests of vice and disease already built, at any rate to prevent similar places from being erected in future."

The Rev. T. W. Darwell, curate of St. James's parish, Dover, says—

"My own observations and experience in visiting among the poor, tend most decidedly to confirm the evidence that better sanitary regulations would tend very materially to improve the habits of the people. The poor man, when fatigued, cannot be expected to remain in his house, if his wearied senses are to be oppressed by noisome stenches and disgusting objects. He naturally seeks the beer-shop as a refuge, and his wife and family are left to seek relief, under such circumstances, as they may. Thus the domestic bond is loosened, if not severed; he ceases to regard his family, and they cease to respect him, and so a generation of reckless and unprincipled persons is by these means turned out upon society."

The Rev. J. Puckle, Incumbent of St. Mary's, Dover, in a letter addressed to the superintending inspector, in 1848, says—

"From a ministerial experience of 13 years, I am perfectly satisfied of the close connection subsisting between the sanitary and the moral condition of our poorer classes. I have found, without any exception, the worst demoralization in the worst constituted dwellings and neighbourhoods, the one being traceable from the other, directly, as effect from cause. To what extent we may ever succeed in raising the moral tone of our poor people's habits of life, time only can show; but I affirm, in conscience, that to raise them while they live in such places, and under such circumstances, is impossible."

The relieving officer, of the Falmouth district, in his evidence given before the Superintending Inspector says, "I pay in out-door relief from £8 to £9 per week in the district; in the town of Falmouth about £5 a week. Have seen fever in the places I visit. Pay most relief in the worst places. Sometimes continue payment five or six weeks to one family, and as much as seven or eight shillings a week. Much of this disease might have been saved, if fever could have been prevented. See much misery. The people do not complain so much as we complain of the nuisances. Had extra relief to pay for cholera in 1848 and 1849, and pay to this day (1854) to some of the families made paupers by the cholera."

The medical officer to the Falmouth Union states—

"Fever prevails in most of the courts. It is invariably found with dirt. Where there are defective ventilation and bad drainage, there we get fever. Many of the bedroom windows will not open. The rooms are about twelve feet by ten feet, and seven and-a-half feet high. Ten persons occupy such rooms. Have been obliged to knock out a square of glass in a window to get ventilation. This overcrowding lowers the standard of morality. Much disease is traceable to intemperance. Men are driven from an uncomfortable home to the public house."

The following extracts from the "Report of the Commissioners appointed to inquire into the causes which led to, or which aggravated the outbreak of cholera in Newcastle-upon-Tyne, Gateshead, and Tynemouth," show the sanitary condition of the dwellings of the poor in those towns in 1853.

Speaking of Newcastle, the Commissioners say:—"There are considerable districts, especially in the lower and older parts of the town, in which almost all the houses are built back to back, so as to be incapable of thorough ventilation, and with their fronts within so few feet of one another as to render it almost impossible for sunshine, wind, or rain to reach directly even their exterior walls; many of these miserable lanes or entries being, moreover, closed up or covered over at one or even at both ends.

"That, on entering some of the houses in such localities, during our day-inspections of the town, we were arrested at the door by a darkness which was little less than total; and medical officers are sometimes under the necessity of taking a candle, in order to see their patients in some of the rooms in these places, even at noonday, and in the height of summer.

"That the poorer inhabitants are not only very ill-lodged, but exceedingly over-crowded in their lodgings. That about half the families in the town are confined to the occupancy, or joint occupancy, of exceedingly over-crowded single-room tenements. That in September, 1853, cholera broke out in rooms in which as many as twenty to twenty-five occupiers were congregated; there being only fifty cubic feet of space or air (furniture, &c., not considered) for each individual. That, in consequence of the frequent ill-construction, ill-ventilation, and over-crowding of the habitations of the poorer classes (as well as the want of sewerage, drainage, proper domestic conveniences, and other matters), the condition of many of the tenements which form the residences of about three-fourths, and especially the condition of many of the single-room tenements which form the residences of about half, of the entire population, has habitually been 'filthy and unwholesome,' even where not technically described as 'unfit for human habitation;' that the stench experienced on entering some of them is in the highest degree offensive; and that the effects upon the health of the inmates, and of the vicinity generally, can only be equalled by the corresponding effect upon their morals and sense of decency."

The Commissioners state that there are are 15,000 families, or not less than two-thirds of the population of the town, who have no right of access to a private "privy;" and that ash-pit accommodation is almost equally deficient.

The Commissioners close their report, as regards Newcastle, with a statement of the pecuniary loss sustained by the ratepayers, as the result of the outbreak of cholera. "The Board of Guardians expended, for immediate services, about £4,000; between £6,000 and £7,000 were expended under the supervision of the Vicar; an excess of at least £3,000 above the usual expenditure for sick and funeral monies was incurred by the benefit societies; £500 were expended by the Town Council; an annual expense of about £2,600 was incurred by the Board of Guardians, for the maintenance of widows, orphans, and others, which at only eight years' purchase would be worth some £21,000; making altogether an expense of some £35,000, or thereabouts, over and above the very serious loss to the town from stoppage of trade, &c."

With regard to Gateshead, the commissioners state "That the same radically bad system of house-construction, described as prevailing in considerable districts of Newcastle, prevails also, and probably to a larger extent comparatively, in Gateshead; that a large proportion of the houses occupied by the poorer classes (who apparently constitute four-fifths of the entire population) are built back to back with one another, or, where not actually back to back, with backyards between them so small as to serve only to receive accumulations of filth, and to be quite inadequate for wholesome ventilation; that the spaces between the fronts of these back-to-back rows of houses are so narrow as to render it almost impossible for either sun or wind to get at them, and to render them habitually dark and unwholesome; that one or other end of these narrow alleys is not unfrequently closed or built up, whilst in some cases, smaller lateral *culs-de-sac* are found leading out of a larger one; the other ends of these miserable places being also sometimes built over, so as to leave nothing but a single covered way for ingress or egress; that in other cases the houses are built into the abrupt riverward slope or bank, so as to have one or more of the walls, for one or more stories in height, in close proximity with the earth of the acclivity above—while in some instances both these evils are combined, and in this way, throughout considerable districts, chiefly occupied by the poorer classes, ventilation is rendered almost impossible.

"That a large part of the dwellings of the poorer classes are not fit for human habitation; that at least one-half of the population of Gateshead is thus dangerously mis-lodged; that a considerable part of those dwellings are not only not fit, but incapable of being rendered fit for such a purpose.

"That the poorer classes of Gateshead are not only exceedingly ill-lodged, but also much overcrowded in their lodgings; that it is an habitual thing for an entire family to live, sleep, cook, eat, wash, &c., in a single room; the corners of single rooms thus occupied, being occasionally further sub-let to other families or lodgers." With regard to privy accommodation, the commissioners state that Gateshead is as deficient as Newcastle, whilst in one point it is even more deficient, viz., in not having a single public privy.

With reference to the cost of the epidemic in Gateshead, the commissioners say "That an expense of about £1,278 was incurred by the Board of Guardians for immediate services; that a public subscription of about £600 was similarly expended; that an annual expense of about £450 was incurred for the maintenance of persons thereby rendered chargeable to the poor rates, which, at only six years' purchase, would amount to £2,700; so that, without considering the loss arising from stoppage of trade, &c., the cost of the outbreak amounted to some £4,600."

CONCLUSIONS.

A close study of house accommodation, especially for many of the poor, not only of this country but of all countries, has led me to the following conclusions:—

That, as a rule, men so construct their habitations as to vitiate the common atmospheric air, rendering the free breath of life a fruitful source of disease.

By placing houses on improper sites.

By leaving those sites unformed, undrained, unpaved, and uncleansed.

By using improper materials for houses, and by adopting unsuitable plans.

By totally neglecting adequate means to secure ventilation.

By overcrowding, by indiscriminately mixing the sexes, and by allowing the adoption of habits of filth.

That the results in all ages have been fevers, plague, and all the analogous diseases which destroy infant life, and which cut off mature adults.

That there may be portions of the earth's surface unfitted for the use of man, but that, as a rule, the sources of disease are not so much in countries, in climates, in sites, in elevation, in density of population, or in any other external cause, as within the walls and beneath the roofs of the houses and tenements. Masses of people, living contrary to the simple laws of nature are necessary to decimating epidemics, and not peculiar climates, geological formations, great rivers, river deltas, inland plains or mountains.

That fresh air is the first requisite to health, and that any houses which do not admit of fresh air being breathed by the inmates—waking and sleeping—are defective in construction, are also defective in arrangement, and probably most defective in personal management.

That the poor of this country cannot provide themselves with houses suitable to health, but must inhabit such as are placed at their service.

That many of the poor, and many working men, can afford to pay a sufficient rent for healthy cottages or rooms, if they had a choice betwixt good and bad cottages and rooms, or could obtain healthy places of residence.

That, in many instances, the losses caused by defective house accommodation are either direct, or indirect, charges upon parishes. Foul air induces fever; fever destroys adult life, and then widows and orphan children become a parish charge.

REMEDIAL MEASURES PROPOSED.

That in parishes, corporations, or in separate districts, there shall be an Inspector of Nuisances appointed; but that several small or poor places may be combined under one inspector, with the sanction of the General Board of Health.

That upon an outbreak of contagious fever, small pox, or other zymotic disease, the parish doctor, local medical officer, or local inspector of nuisances, shall have power to inspect the premises, and report to the local authorities.

That there shall be local power to insist on proper means of ventilation to all cottages and room tenements; and that lime-washing may be ordered, or may be executed by the parish authorities, the cost to be recovered from the landlord.

That subsoil and surface draining may be ordered, or may be executed where required.

That every room appropriated for human habitation shall have, at the least, one door and one window, capable of admitting sufficient light, and that such window shall be so constructed as to open so as to allow of full ventilation.

That there shall be sufficient "privy" accommodation to all houses and tenements, of not less than one seat to each ten persons.

That there shall be means of external ventilation and sun light to all dwelling-houses.

That there shall be means for a separation of the sexes in all houses and in all room-tenements.

An improvement in the law so as to facilitate the sale of land for house building purposes, would afford means for improvement.

In new buildings, rooms to be inhabited should not be less in height from floor to ceiling than nine feet vertical.

All houses should have the roof eaves spouted; and all yards, courts, and passages in the immediate vicinity of houses should be paved, or flagged, and surface-channelled.

I have briefly and imperfectly treated a most important subject, and must now leave the question of improved house accommodation to the consideration of our legislators and thinking men. The problem of house accommodation deserves to be worked out. If defective houses were only inhabited by the poor, remedial measures would be imperative on Christians; but the case is more hopeful. Very many families earning good wages (from £1 to £2 per week) can obtain nothing better in which to live than a wretched hovel, a cottage in a blind alley, or a house up a narrow and dark court, or some miserable rooms or single-room tenement. The prices charged and paid vary from 2s. 6d. to 5s. 6d. per week; in the one case, £6 10s., and in the other, £14 6s. per annum. It is practicable to build cottages in the country and in small towns, having four rooms, for a rent of £6 10s. per annum, and blocks of houses in towns and cities, of equal accommodation, for a rent of £10 per annum, the common rate of interest being received in the form of rent; such houses to be properly sewered and drained, to have wash-house and drying-ground—in common to, say, ten such tenements,—to have a full supply of good water, to have "privy" accommodation adequate to privacy and decency, and to have means for ventilation and light to each room. In the country, garden allotments are a comfort, a source of profit to landlord and to tenant alike, and a great blessing to the provider and the user. Ornamental cottages, if the ornament is costly, are not required. Improved dwellings and cottage allotments should not be made into show-places. An honest poor man does not require petting, but opportunity to be a good Christian, and to live by labour. He is sure, under such conditions, to be a good citizen.

Human society, to be stable, must be like the pyramid; the foundation must be broad, and it must be secure. The mystic priests of Egypt expressed their ideas in symbols, and I am not sure the pyramid was not intended to symbolise the construction of a nation. The broad, spreading base—the people; the diminishing, but rising courses—the middle classes; the upper courses—the nobility; crowned by the kingly apex—forming the only practicable finish to a symmetrical, secure, and enduring structure. The idea may be a vain fancy; but if Great Britain is to endure—if *our* civilisation is to progress—if our religion is to bear appropriate fruit—if the great social evil is to be grappled with and subdued—the base of her society must be improved—the people must have the opportunity of health and of morality, that they may be both good Christians and loyal citizens!

DISCUSSION.

Dr. Ellis said that he had had extensive opportunities of observing the condition of the lower classes with respect to their dwellings, and could bear his testimony that the picture drawn by Mr. Rawlinson was by no means over-coloured, and he thought much general deterioration of health might be traced to the neglected condition of the poor. He entirely concurred in the remark of Mr. Rawlinson, that whilst on the one hand they could not but admire the benevolence, and charity, and zeal of those who went amongst the poor for the purpose of mitigating their sufferings and elevating their morals; yet, on the other hand, the endeavours to purify and correct were begun at the wrong end. He thought that the legislature ought not to be called upon to interfere in matters which the public generally could do for themselves, apart from all legislative enactments, which, in his opinion, would, after all, be ineffectual in providing a remedy for the evils complained of. He believed the extensive publication of the paper they had heard that evening throughout the towns and hamlets of the country, which so graphically and truthfully described the social condition of the great masses of the poorer classes, would have more effect in remedying the existing state of things than any legislative measures. The landlords had laid themselves open to severe reflections, though he was happy to say there were many honourable exceptions, foremost amongst whom might be mentioned the Duke of Bedford, on whose estates the cottages for the poor were models worthy of imitation. He was quite of opinion with Mr. Rawlinson, that it was from the want of information on these matters, rather than from any indisposition to effect the improvements which were so loudly called for, that the present state of things existed. He should like to see the subject ventilated by lectures given throughout the country, and no better picture of the existing evils could be drawn than that which had been so truthfully exhibited before them that evening. He was a decided advocate for lectures, by means of which he thought the public ear was most readily gained. Their endeavours ought to be directed towards the improvement of the health and morals of the poorer classes, by promoting a simple adherence to the laws of nature. By these means they would preserve in health those who were not already diseased, and restore those who were already afflicted with disease. He therefore said, let the people be instructed as to the value of cleanly dwellings, for there was no doubt that decent homes might be provided at no greater cost than was now expended for places which were not worthy of the designation of dwellings.

Mr. Edwin Chadwick, C.B., said that it might have been desired that practical details of measures of amendment should have been entered into, and there were few more capable of dealing with them than Mr. Rawlinson, but the necessary statement of the chief existing evils more than sufficed for one night's discussion. The statement of the evils should, however, be always accompanied by the encouraging fact, that in various instances, not only in London, but in other capitals in Europe, the promise of amendment had been fully realised in model dwellings, extremely rude and imperfect in construction as he believed they generally were. The death rates in them had, however, been kept steadily down to 13 in a thousand, the death rates attached to the dwellings of the poor being about 30 in a thousand, and in the general population of the metropolis about 23 in a thousand. The promise of amendment had been realised by the enforcement of his Lordship's Act for the regulation of common lodging houses, under which typhus had been almost banished from places known as fever nests, now superior in condition to immense masses of tenements occupied by workmen earning the highest wages. That measure, which had been exclaimed against as an undue interference, was only an application of the principles of the common law, under which owners had once been made amenable for letting tenements so constructed or so occupied as to create disease and to be dangerous in times of plague. In respect to the cost of amendment, the partially improved tenements were, when examined, by no means so unpromising as might at first appear. One of the earliest instances was a block of bulidings erected at St. Pancras, by the Metropoliton Society for the Improvement of the Dwellings of the Labouring Classes. The return upon that particular block, occupied by more than 500 persons, was, with all the extra expenses of company's management, about 4½ per cent. But on looking at the details of construction, with competent professional aid, he was warranted in alleging, that by the reduction of unnecessary materials used for no sanitary purpose, as good sanitary results might be obtained by an outlay of at least one-third less, giving a return of seven per cent. or more. It was a main fact, which should not be omitted in the statement of this question, that tenements of the very worst description produced the highest return upon the actual or necessary outlay of capital. At one period, when he enquired into the subject, he found that the general return upon house property was, for houses of the highest class, about 6 per cent.; for houses of the lower portion of the middle classes, from 7 to 8 per cent.; and for tenements occupied by the labouring classes, 12 per cent., or more, on the average, and not unfrequently as high as 16 per cent. But this excess of return for the worst description of property was generally absorbed by the expense of the weekly collection of rents, by their uncertainty, from changes of tenants, from sickness, and otherwise; and the greater part of the disablement from sickness, as well as the perpetual changes and fluctuations of the tenancy, were occasioned by the bad sanitary construction. He believed that by the application of capital on a large scale, much structural improvement might be effected, without increase of cost, and often with considerable economy; for many tenements, though cheap to construct, would be found practically dear to the tenant and the public, on account of the rates. The structural improvements desirable might, he thought, be dealt with in detail by the Society. There were the wall question, the grate question, and the chimney question, and there might be a window and a roof question, in addition to the ventilation question. There were wanted a non-absorbent brick, a brick that absorbed, at all events, less than a pint of water, and a wall that was not a prolonged sponge, occasioning damp, and requiring an excessive quantity of fuel to keep it dry; there were still required a more economical fire-place, which should give out as much heat with one-half the quantity of fuel at present used, and a chimney as well as a grate which did not discharge five-sixths or six-sevenths of the caloric unapplied; there was wanted a window for the lower class of houses, which did not, as windows made with the very thin glass now used did, discharge by radiation about one-third of the warmth of a room, the product of combustion, so that if a poor man paid a shilling a week for the warming of his apartment, fourpence worth of the product of combustion was wasted by the inferior windows. He thought these might form important topics for the consideration of the Society.

Mr. James Caird, M.P., could have wished, with Mr. Chadwick, that the paper had been of a more practical character. He had attended in the hope of listening to details of practical building to be applied to the dwellings of the poor, and had hoped to receive some instruction as to how the evils complained of might be obviated. He believed the whole country would approve of the principles laid down by Mr. Rawlinson, and was fully alive to the importance of the subject. He therefore thought that their time would have been more profitably occupied in discussing the practical details of the question than in the laying down of principles to which he thought there could not but be universal assent.

Mr. Thos. Scott was so strongly impressed with the belief that the right course had been taken by Mr. Rawlinson in treating this important subject, that he could not agree with the remarks of the last speaker with regard to the discussion of the practical details. They all knew that the President of the Society had set the good example of building model cottages for labourers, and yet they had been condemned by many architects. At the same time His Royal Highness had done much good by enunciating the principle that better dwellings for the poor were required. In like manner Mr. Rawlinson had shown the necessity of cultivating a proper sense of the importance of this subject amongst those who have the means of providing better accommodation in the dwellings of the working classes. It was not always the case that the appearance of sanitary commissioners in a town tended to increase the value of property. He had known instances in which property had been greatly depreciated by that means, though he was ready to admit that in large towns the necessity of municipal or parochial interference in these matters was often evident. Mr. Scott proceeded to argue in favour of the promulgation of correct views in these matters, and of thus stimulating a desire for improvement amongst the people themselves. He instanced cases in Ireland and Scotland, illustrating the difficulty there was in overcoming long-rooted prejudices in favour of the cabin and the hut. It required the promulgation of principles to dispel those prejudices, and to raise the taste of a people to a true appreciation of the improvements which were designed for their benefit.

Mr. T. D. Acland regarded this subject as one of the greatest importance, and he believed he was not singular in that view. No doubt, amongst landlords there were to be found many selfish men, and the more they were denounced the better; although, perhaps, after all, that was not the best way of improving them. This subject had engaged the public mind for a great many years, and he was happy to say there were many good men earnest in the cause, but what they wanted to know was how to adapt the necessary improvements to the houses of the poorer classes, without being charged 20 per cent. more by the builder for carrying them into execution. He had lately been building on his own account, and though he had given most positive instrutions that the best known method of ventilation should be adopted, the builder had stated that he was unable to find any really practical system which he could adopt. It was known to many present, that the late Mr. Pusey, who was connected with the Royal Agricultural Society, had for sixteen years been constantly occupied with the subject of improving the dwellings of the labouring classes, and year after year had offered prizes for improved designs for cottages. It was universally admitted that good cottages should be provided for the people. They were told by the highest authority that if the poor man needed a cloak they should give it him; but he thought the practical question was the discovery of such means as would enable builders to construct such houses as should, at the current rate of wages for labour, enable the occupier to pay a remunerative rent to the builder for his outlay. He was equally surprised and gratified at hearing a few days since from Mr. Robert Smith, well-known in the agricultural world, that he had erected, in the district of Exmoor, six cottages, with three bed-rooms and a fire place upstairs, at a cost of only £60 apiece. That was a fact of great importance, and he hoped ere long Mr. Smith would give the world the benefit of his experience in this matter. For his own part he had always found difficulty in erecting cottages for £100 each. He hoped that Mr. Rawlinson, who was so well-qualified for the task, would, on a future occasion, point out some practical means by which this desirable object could be attained, namely, the erection of good and wholesome houses for the poor at a moderate cost.

Dr. Wyld advocated the plan of making iron bedsteads fixtures in a house, in the same way as was now done with fire grates. He thought if in one particular the poorer classes were more miserable and wretched than another it was in their sleeping accommodation. As a means of circulating statements of principles, and diffusing information on this subject generally throughout the country, he thought an excellent plan would be, that the numerous applicants at the hospitals should each receive a tract containing information upon this matter, and pointing out the conditions that were necessary for the enjoyment of good health. By that means interest would be excited on the subject amongst the masses, and much good would thus be effected.

Mr. G. F. Wilson, F.R.S., said in the suburbs of London with which he was most acquainted, namely, Vauxhall and Battersea, the rents of ill-built, ill-arranged cottages, were from 6s. to 7s. 6d. per week. He thought architects and builders present would say that gave a sufficient interest for money for erecting well-built houses with five rooms well ventilated. The difficulty as to the collection of rents might, he thought, be overcome in localities where there were large manufactories, by an arrangement being entered into between the builder of the houses and the employers of the men, for stopping the rent out of their weekly wages. He felt quite sure the working classes would appreciate good dwellings at fair rents.

Dr. Waller Lewis congratulated the meeting on being presided over by so practical a philanthropist as the noble lord in the chair, who had done so much, both in his public and private capacity, for the improvement of the dwellings of the poor. There was one point with reference to ventilation of rooms which was more a chemical than a mechanical fact, and which was generally overlooked. It was thought by architects and gentlemen not very much accustomed to chemical analysis, that the whole mischief of the want of proper ventilation was owing to the loss of oxygen from the atmosphere, and the substitution in its place of carbonic acid gas. That was by no means the case. A series of carefully conducted experiments had been made by a French physiologist of eminence on this subject. He confined some birds in a close box, absorbing, by means of chloride of calcium, the carbonic acid, as rapidly as it was formed, while he supplied fresh oxygen as it was required, so as to keep the atmosphere in its proper chemical condition. Notwithstanding, the birds died rapidly, showing that the mischief arose from the animal exhalations which destroyed life. It was the same with human beings confined in close atmospheres. One thing specially, it was well known, tended to the overcrowding of houses, and that was the improvements carried on in large towns, which necessarily, by destroying the smaller houses, drove the working classes away from their former habitations. As medical officer of one of the largest Government departments, the Post Office, he had had opportunities of seeing the effect of that system. He had just completed a series of calculations, based upon inquiries relative to the domiciliary condition of the 2,000 persons employed in the Post office, and he found that of that number 513 were obliged to live at a distance from their work of 1 mile and upwards; 358 at a distance of 2 miles and upwards; 104 at a distance of 3 miles and upwards; and 47 at a distance of 4 miles and upwards; whilst some few lived at a distance of 6 miles and upwards. They were not only banished to a long distance from their work, but they had to exert themselves by walking double that distance, and if they had to appear at the office twice in the day, even four times that distance. It was also to be remarked that the employés of the Post-office had to pay a large proportion of their salaries for bad accommodation in the way of habitations. He found there were living in single rooms, 17, with 4 in family; 8 with 5 in family; and 4 with 6 in family. There were living in 2 small rooms, 30 with 5 in family; 18 with 6 in family; 8 with 7 in family; 5 with 8 in family; 3 with 9 in family; 1 with 10 in family; and 1 with 11 in family. The amount of rent paid by these men was, on an average, as follows:—Married letter carriers, 5s. 2d. per week, or 20 per cent. of their salaries; single letter carriers, 3s. 7d. or 12 per cent.; married messengers, 6s. or 20 per cent.; single messengers, 4s. or 13 per cent.; married sorters, 6s. 6d. or 25 per cent.; single sorters, 4s. 6d. or 16 per cent. of their salaries. Unmarried men paid for single rooms from 2s. to 5s. 6d. per week, being an average of 3s. 4d.; and one now even paid 4s. for half a room. Many of these poor men stated that their lodgings were healthy, but the fact was they had no conception of what real health was. He might add that during the prevalence of the epidemic at Newcastle, which had been referred to in the paper, some of the houses he had visited were so intensely unhealthy that he could not stay in the room for many minutes at a time, and yet the poor creatures living in them believed that the air was in a perfectly natural state. He agreed that some practical means of teaching people the difference between a good and bad sanitary condition, between a pure and a vitiated atmosphere, would be most valuable.

Mr. PALMER mentioned instances within his own experience of the advantages, in a commercial point of view, resulting from the improvement of existing dwellings. The health and comfort of the inhabitants were promoted, and they cheerfully paid the small addition to the rent which was necessary to compensate for the outlay in effecting these improvements.

Mr. TOTTIE gave some particulars, in addition to those mentioned by Mr. Chadwick, relative to the block of buildings in St. Pancras. At present they had from 16 to 20 vacancies in the premises, which he attributed to an excess of building in that locality, inasmuch as out of 449 houses erected since the establishment of those premises, 79 had bills in their windows. The fact was, the supply of houses in the neighbourhood was at the present time greater than the demand.

Mr. J. A. ROSE felt convinced that this discussion would do good to all classes. The landlord learnt that by improving existing houses he might get sixpence a week more rent from his tenant, and he apprehended that after all it was only by the consideration of the question commercially, that any large measures for alleviating the condition of the working classes, in respect of their dwellings, were likely to be promoted; for in looking at this subject, they must take human nature as it actually was, and not as they could wish it to be. Then, again, the statement being put forth that cottages might be built for £60 each, would probably have, in some cases, this effect—that as rents were so much lower, the workman could do with less wages. Much as had been said about ventilation, he thought they had a good deal to learn before they arrived at a really practical plan. Mr. Rose added some remarks in advocacy of affording proper accommodation for the sleeping of domestic servants—a class which he feared was generally much neglected in this respect.

The CHAIRMAN, in proposing a vote of thanks to Mr. Rawlinson for his able paper, remarked that he could speak with perfect confidence as to the merits of that gentleman, because it had been his pleasure to be associated with him for many years in works of this description. During the time that he (the Chairman) had the honour of holding a seat at the Board of Health, Mr. Rawlinson was one of their agents, and for diligence and activity, knowledge and zeal—not merely professional zeal, but influenced by deeply moral and humane feelings—he was unsurpassed. They were all acquainted with the valuable services he had rendered to the country as the Government civil engineer at Scutari and the Crimea; and he (the Chairman) was glad to find that he had returned fresh and vigorous, determined to devote his great energies to the improvement of the condition of the human race in his own country. He believed the announcement that the paper to be read was upon the social and national influence of the domiciliary condition of the people, had attracted a great many to this meeting, especially the ladies, and he could not but feel that, in his opinion, the paper was in strict keeping with its title. He was convinced that the domiciliary condition of the people was at the root of all moral and religious improvement. It was astounding to observe what effects good dwellings, with plenty of air and sunshine, had upon the morals of a community; they tended more than anything else to combat that monster evil—the vice of intemperance. He, therefore, thought the proper way to enter upon the discussion of this question was to begin with a statement of principles. He agreed with Mr. Chadwick, that in contemplating existing evils they ought not lose sight of the good that had been effected in this direction, in many of our large towns and in various quarters throughout the country, but the good that had been already effected only imposed upon them the duty of making still greater exertions to carry it on to its utmost limits. With regard to the erection of new dwellings for the working classes upon the best sanitary conditions in densely populated towns, where the price of land, labour, and materials was very high, he felt there was but small chance of doing so with a remunerative profit. They could not look for more than 6 or 6½ per cent., which the builder did not regard as a sufficient return for his capital. But, as had been stated this evening, very much might be done in improving existing buildings and localities, so as to render them fit for habitation, and this would, as almost every instance had proved, be attended with a remunerative return to those by whom the improvement was effected. The Chairman then proceeded to explain the improvements which had been carried out in the localities of Wyld-court and Tyndals-buildings, and mentioned the beneficial results that had accrued therefrom, in the elevation of the moral and social condition of the inhabitants. In the country there was a very great difference in this respect; the cost of land, which formed the principal item in large towns, being so much less, and labour and materials cheaper. Still he had found that he could not build a pair of cottages for less than £280, and a high rent must be paid in order to afford a fair interest for that outlay. What they required, therefore, was a cheaper but not less efficient mode of building cottages, with not less than three bedrooms, which he held to be indispensable for every family. Ventilation was a matter of the utmost importance, but the poor were found to prefer warmth to pure air so strongly, that he had in some instances resorted to the stratagem of introducing a concealed ventilator in order to render their dwellings healthy. In carrying out improvements it was necessary that the tenants should peremptorily be prohibited from taking lodgers, or the existing evils would be increased. In conclusion his lordship said he felt the deep importance of the question under discussion, which he thought lay at the root of all that concerned the religious and moral state of the people, and he was certain that if they would use every effort to raise the poor to that condition which they ought to occupy as Christians and responsible beings, he, for his part, should have no fear either of the progress of infidelity or of democracy.

A vote of thanks was then passed to Mr. Rawlinson.

On the table were exhibited specimens illustrating the decay of Gutta Percha, as described

in Mr. Highton's report. (See "Decay of Gutta Percha," given below.)

The Secretary announced that on Wednesday evening next, the 10th inst., a paper by Mr. J. Algernon Clarke, "On the Application of Steam Power to the Cultivation of the Soil," would be read.

DECAY OF GUTTA PERCHA.

The following report of Mr. E. Highton, to the Directors of the British Telegraph Company, is the result of further experiments made by that gentleman. It will be recollected that the results of his former investigations were given in the last volume of the *Journal*.*

"*To the Directors of the British Telegraph Company.*

"Gentlemen,—I beg to hand you several specimens of gutta percha-covered wire, and also sheet gutta percha, which have been experimentally subjected to the action of the mycellium of a fungus, viz., the *Agaricus Campestris.*

"The gutta percha was placed in different parts of a bed of soil, 5ft. 6in. wide by 5ft. 3in. long. The spawn of the fungus was placed in the soil, at intervals, over that space, in the month of September, 1857.

"The mycellium traversed the whole of the bed.

"The gutta percha sent has not been touched by the hand or a tool until exhumed on the 25th of January, 1858.

"The several specimens sent will show the complete destruction of gutta percha by the mycellium of a fungus, and prove, I trust, the correctness of the opinion I expressed many months ago.

"Should the Company desire any further experiments, I shall be happy to make them; but I consider those already made by me so conclusive as to render further experiments in the same line unnecessary.

"I am, gentlemen, your obedient servant,
"EDWARD HIGHTON.

"London, January 28th, 1858."

The specimens referred to may be seen at the House of the Society of Arts.

SOUTH KENSINGTON MUSEUM.

The weekly course of lectures addressed to the working classes, explanatory of the collection of animal products, has been successful, attracting full audiences in the lecture theatre. Three lectures have already been delivered. The first, a general introductory one, on "The Animal Kingdom and its Economic Uses," was given on the 18th ult., by Professor Owen, F.R.S., Superintendent of the Natural History Department of the British Museum. The second, on the 25th ult., on "The Use of Refuse Animal Matter," by Dr. Lyon Playfair, C.B., F.R.S., Chief Inspector of Science Schools. The third, on "Shells and their Economic Uses," was given on Monday evening, the 1st inst., by P. L. Simmonds, Esq., of the Museum, in the absence of Dr. J. E. Gray, F.R.S., who was prevented by illness from attending. The lecture was illustrated by specimens from the Museum and Mr. Simmonds' private collection. Frank Buckland, Esq., Surgeon to the 2nd Life Guards, will deliver the next lecture, on Monday evening, the 8th inst., "On Horn, Hair, and Bristles."

During the week ending 30th January, 1858, the visitors have been as follows:—On Monday, Tuesday, and Saturday (free days), 2,460; on Monday, and Tuesday, (free evenings), 2,247. On the three students' days (admission to the public 6d.), 630. One students' evening, Wednesday, 243. Total, 5,580.

SMOKE NUISANCE.

The following is the report of Mr. Cashin, the Corporation Consulting Inspector in Sheffield:—

Gentlemen,—Pursuant to your instructions, I beg to report that during the past year, in all cases in which you have directed a summons to issue for a breach of the smoke bye-laws, the full penalty has been inflicted, save in some exceptional cases, in which—looking at the fact that you desire not the imposition of fines, but compliance with the law—valid explanations were offered, and I did not feel at liberty to oppose an application for time to make alterations. In one case, however, that of Mr. W. H. Brown, of Harvest-lane, it was held that rolling-mill furnaces, even when connected with an engine chimney, were exempt from the operation of the law.

Progress has been made in the suppression of the smoke nuisance, but much has yet to be done to secure its permanent abatement. Inspector Wood's reports show that during the years 1855 and 1856 he had to record a discharge of smoke varying from 20 to 35 minutes in the hour from nearly all the chimneys of which he took observations—such cases are now the exceptions.

The bye-laws have not been harshly or rigorously applied; on the contrary, every effort has been made to carry them out in the most conciliatory spirit, and to make them as little irksome as possible to the class whom they affect. The committee have demanded not the absolute consumption of smoke, but so much as has been proved to be practicable; and in proper cases where efficient means had been provided for the accomplishment of this object, the engine-tenters have been proceeded against for negligence.

Many experiments, entailing serious expense and resulting in failure, have been tried; and much money has been spent in applying plans importunately forced upon attention which have been utterly useless. For such results it is sometimes urged that the committee are responsible, as they do not undertake to prescribe some particular plan. Apart from the objection that the employment or adequate payment of a competent person to direct the application of such plan would be opposed to public feeling, it is obvious that no one plan can meet varied requirements. Adaptation to meet the peculiar circumstances of each case is needed; and were the committee to exact the removal of the radical defects which exist in numerous instances, and which preclude the application of an effective plan, such mode of procedure would be more loudly objected to than the present. But, independently of this, it is clearly the duty of steam-engine proprietors, either by combined action or individually, to obtain efficient advice at their own expense and not at the expense of the ratepayers.

Another objection pertinaciously urged is, that the gases resulting from perfect combustion are more injurious to health than smoke. It is true that carbonic acid gas is injurious to animal life, but, under the circumstances, the objection does not apply. Carbonic acid in its natural state is specifically heavier than air, but as the result of combustion it issues from the chimney, not at the ordinary temperature of the air, but expanded by heat to more than double its ordinary bulk; it is then specifically lighter than the atmosphere in which it ascends and becomes diffused. No analogy obtains between this gas and a noxious mechanical mixture such as smoke. An excess of carbonic acid cannot exist in the atmosphere, the relative proportions of the constituent gases of which are constant, derangements arising from surface and low level exhalations being merely local and temporary.

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* See Vol. V., pp. 264 and 486.

The prevention of smoke has for some time occupied the attention of scientific men, and no fact is better ascertained than that smoke is the result of a defective mode of supplying air to the crude gas evolved from the coal. The nuisance is produced by the carbonaceous mixture which passes off with this gas when the coals are clumsily burnt, without proper arrangements for the admission of air. To regulate the due admission of air, is the object generally proposed to be accomplished.

The present construction of furnaces and mode of applying heat demands a large continuous supply of atmospheric air, varying with the rate of combustion and the quantity and quality of the fuel.

If too much air be admitted into the furnace it absorbs heat, chills the flues, and reduces the temperature below the combustion point, causing smoke and a great waste of fuel. If an insufficient quantity be supplied, the hydrocarbonates—the constituents of coal gas—pass off with a large proportion of carbon in minute particles unconsumed. These carry with them not only the large quantity of heat which they are capable of giving out on combustion, but the heat expended in their elimination from the coal.

But so rude and imperfect is the present mode of construction, that with the best appliances and mechanical arrangements to assist the natural affinities and combination of the gases, more than double the quantity of air absolutely necessary for combustion passes through the furnace, carrying with it the heat which it absorbs. In an ordinary furnace it is found in practice that about 300,000 cubic feet, or eleven tons, of air pass through for every ton of coals consumed!

This materially affects the available heating power of the coal, which is further limited by the rate of combustion. With rapid combustion there is necessarily a sacrifice of fuel; more heat is generated in a given time, and consequently more water evaporated, but a large proportion of the heat is carried away by the increased temperature of the escaping products. With slow combustion more time is afforded for the heat to be taken up, and consequently more is utilized.

In all cases, however, a large amount of heat passes away through the chimney.

To remedy this primary defect in the existing system, an invention has been patented by Mr. Siemens, of London, which is applicable to nearly every description of heating furnace.

Mr. Siemens proposes to utilize the heat generated, and obtain therefrom the full equivalent of effect by using a regenerative furnace, in which he passes the air required for combustion through a regenerator, and the products of combustion—before they reach the chimney—through another regenerator, which consists of a chamber filled with fragments of refractory materials or firebricks, presenting a large amount of absorbent surface, to which the heat is communicated; the bricks or other substances nearest the fire become heated to a high degree of temperature; those next to them become heated to a less degree; and those at the other extremity comparatively little—the temperature gradually decreasing towards the outlet. Were this process to continue, the whole regenerator would attain the same heat as the escaping gases, which would then pass into the chimney as hot as when they entered the regenerator, and no good would result; but by a beautifully simple arrangement the inlet for the air and the outlet to the chimney are so connected with both regenerators (which are constructed of the same materials) that by changing a valve the current is reversed; the air passes through the heated regenerator and attains a high temperature before it reaches the fire, and the products of combustion pass through the regenerator, through which the air had previously passed in a contrary direction. When this regenerator becomes charged with heat, the valve is again reversed, and the alternate action continued.

By these means, with a minimum draught, intimate mechanical contact and consequent chemical union of the gases are established, and the heat generated is retained in the furnace—the products of combustion escaping at a temperature not exceeding 200° or 300° Fahrenheit.

Rolling-mill furnaces, constructed on this principle, have been in use at Messrs. Marriott and Atkinson's for some months; and in reference to them, Mr. Atkinson, at a meeting of the Institution of Mechanical Engineers, in June, 1857, stated that he "had a particular account kept of the coals consumed by a furnace on Mr. Siemen's plan and one of the ordinary construction, and he found the total consumption of each, during six days, was 7 tons in the ordinary furnace, and 1½ tons in the new one, the work done by each being practically the same, and all circumstances alike during the time of comparison."

Mr. Brown, of the Atlas works, has also had two furnaces erected on the same principle; they are of a large size, for heating bar-steel, and on submitting them to a trial the following results were obtained:—

Furnaces.	Time worked.	Weight of Steel heated.	Coals consumed.	Consumption of coals per cwt. of Steel.
Old	10 hours.	145 cwts.	30 cwts.	23 lbs.
New	10 „	121 „	10 „	9¼ „*
Old	6 days.	77 tons.	26½ tons.	38½ „
New	2 hours.	48 ingots.†	2 cwts.	6¼ „

* 60 per cent. less than the old. † 86lbs. each (about 37 cwt.)

The invention is most valuable where the most intense heat is required; and the result of experiments shows that it may be applied to steel-melting furnaces. In melting steel by the present process, of the heat produced little more than 1 per cent. is made available. On investigating the operation of melting and the calorific effect of coke, I find that the heat given out by the coke in combustion melts only 1-70 of the quantity of steel it is capable of melting if wholly utilized, thus showing that 98·5 per cent. of the heat generated is wasted!

It is proposed to apply the principle to engine furnaces; and on the completion of the experiments I will communicate to you the results.

From the furnaces erected at Mr. Atkinson's and Mr. Brown's no opaque smoke escapes. I append a report of observations made on these and other rolling-mill furnaces by Inspector Wood. The ordinary principle of consuming smoke is not applicable to rolling-mill furnaces, nor do the bye-laws affect them; but when it is considered than an Act of Parliament has been passed relating to the general prevention of smoke in Scotland, and that an act is now in operation in London from the provisions of which no description of furnace is exempt, it seems more than probable that the Smoke Act will be extended to the whole country. It is more economical to anticipate the provisions of such an Act when a convenient opportunity offers, than to comply with them under pressure. In submitting these facts for consideration, I trust I am not departing from my proper province: my desire is simply to afford information that might otherwise possibly escape attention.

I have the honour to be, gentlemen,
Your most obedient servant,
T. F. CASHIN.

16, Bank-street, Sheffield, 6th Jan., 1858.

WORKING MEN'S LIBRARIES.

The Society for the Diffusion of Pure Literature among the People, which is under the presidency of the Earl of Shaftesbury, has issued a notice, stating that by the liberality of one of their number, the committee are enabled to offer, at half-price, libraries of £5 worth and upwards of books for Working Men's Institutions, and similar bodies with a responsible committee or trustees, on the recommendation of a subscriber. The books must be selected from a catalogue issued by the Society. Any person applying for a library should describe the purpose for which it is wanted; and if the grant is passed by the committee they will forward a catalogue to be marked and returned by the applicant (together with the half price of the value of the library), when the books will be sent immediately. Applications should be made to the secretary, at the office of the Society, 9, John-street, Adelphi, W.C., where may be seen copies of most of the books in the catalogue.

Home Correspondence.

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THE "ACCUMULATOR."

SIR,—My attention has been called to the following paragraph, forming part of the Chairman's observations at the meeting of the Society on Jan. 13th:—

"The water which was thus being constantly—day and night—stored up in this magazine of power, remained there subject to the enormous pressure which had been gradually overcome; it was accumulated as a store, to be used in three, four, six, or ten hours, as the case might be, and the apparatus, which was the patented invention of Mr. W. G. Armstrong, of Newcastle, was called an accumulator. He could speak most strongly as to the simplicity and value of this arrangement, by which it was obvious that wherever circumstances were favourable for the collection of streams at an elevation of even a few feet, the hitherto neglected power of such streams might be made available to a much greater extent than they could possibly have been under the system of water wheels alone."

I believe the accumulator has not been patented by Mr. Armstrong, but it will be found in a patent taken out by me in 1851.

I have reason to think, however, that a similar idea occurred to Mr. Armstrong about this time.

I am, &c.,
MICHAEL SCOTT.

26, Great George-street, Westminster, 1st Feb.

LORD PALMERSTON'S MORTAR.

SIR,—With all deference to the high authority of Mr. W. Hawksworth, I venture to point out some few inaccuracies in that gentleman's observations, inserted in your *Journal*, January 29th, upon my proposed steel-bored ordnance.

Mr. Hawksworth says that "the welding of such a mass of steel is open to serious objection." In the manufacture of ordinary gun barrels, the operation of welding the spiral, technically called "jumping," is extremely simple, and as the steel bar is intended to be rolled up on a mandril, in an absolutely close coil with clean faces, by means of a modification of the three cylinder rolls, one "jump" would weld the whole of that part of the coil that had been sufficiently heated, and no injury whatever could take place. Mr. Hawksworth goes on to say that "the cast metal jacket would most assuredly destroy the internal core by crystallisation." Large quantities of chilled cast-iron are used for a variety of purposes, and I never yet saw the iron mould affected by the heat of the melted metal. In the case of my proposed steel bore, it would be impossible to over-heat a mass of steel 18 inches in diameter, 4 inches thick in substance, and 12 feet long, with the addition of a cold iron mandril, fitting the bore, 10 inches in diameter, and two or three feet longer than the steel coil.

Mr. Hawksworth also says that "the shrinkage of steel is greater than that of cast-iron." This may be the case to a very small extent, but when it is considered that the circumference of the cast-iron jacket, three feet in diameter, is double that of the core, and that the latter is at a low degree of heat, the shrinkage will be found to be greatly in favour of the powerful compression and intimate union of the outside jacket with the steel core.

In regard to Mr. Hawksworth's own experimental gun, the result might have been readily anticipated, as cast-steel is well-known to be quite as brittle as cast-iron, and the hammering on a mandril would render it still more fragile. Cast-steel can only be brought into a state of toughness, exceeding seven times the strength of cast-iron, by repeated drawing, and not by hammering alone, which although it hardens and condenses, renders the steel more brittle than before.

It is a mere blacksmith's prejudice that cold hammering can render iron or steel stronger than it is in its natural state. It does become harder to turn in the lathe and to file, but, at the same time, its tenacity is destroyed; as, indeed, one blow too much will send the work to shivers. The steel-bar intended to form my spiral bore, is supposed to be drawn into the state of the utmost tenacity it is capable of acquiring, and all cold hammering, that is, below a cherry-red heat, has been carefully avoided.

I am, &c.,
HENRY W. REVELEY.

Poole, Jan. 31st, 1858.

To Correspondents.

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ERRATA.—In the last number of the *Journal*, page 162, 1st col., line 56, for "Giult" read "Gwilt," and for "315" read "316." Col. 2, line 40, for "waste" read "water." Page 163, col. 2, line 13, for "752" read "52."

MEETINGS FOR THE ENSUING WEEK.

MON. Architects, 8.
Geographical, 8½. I. Journey from Little Namaqualand eastward along the Orange River, the Northern Frontier of the Colony, &c., with Map. By Mr. Robert Moffatt, F.R.G.S. II. Route by the Rivers Waini, Barama, and Cuyuni to the Gold Fields of Caratal, &c. By Sir W. H. Holmes and Mr. W. H. Campbell. III. Preparations for the Departure of the Livingstone Expedition.
TUES. Royal Inst., 3. Prof. Huxley, "On Animals and Plants considered Morphologically."
Syro-Egyptian, 7½. I. Mr. Charles E. Harle, "On the Cylinder of Tiglath Pileser, and notice of a slab lately brought from Hoymijik, illustrating some passages in the Book of Amos." II. Dr. Heinrich Jolowicz, "On Egyptian Mythology."
Civil Engineers, 8. Discussion upon Mr. J. Henderson's Paper, "On the Methods generally employed in Cornwall, in Dressing Tin and Copper Ores." And, if time permits, Mr. J. A. Longridge, M. Inst., C.E., and Mr. C. H. Brooks, "On Submerging Telegraphic Cables."
Med. and Chirurg., 8½.
Zoological, 9.
WED. Literary Fund, 3.
Society of Arts, 8. Mr. J. Algernon Clarke, "On the Application of Steam Power to the Cultivation of the Soil."
Graphic, 8.
Microscopical, 8. Anniversary.
Archæological Asso., 8½.
THURS. Royal Inst., 3. Prof. Tyndall, "On Heat."
Royal Society Club, 6.
Antiquaries, 8.
Royal, 8½.
FRI. Astronomical, 3. Anniversary.
Royal Inst., 8½. Prof. Faraday, "On Static Induction."
SAT. Royal Inst., 3. Prof. Bloxam, "On the Chemistry of the Elements which circulate in Nature."
Medical, 8.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, Jan.* 29, 1858.]

Dated 21*st December*, 1857.

3127. William Thrift and Adam High, Stepney—An improved self-acting ship's water closet.

Dated 28*th December*, 1857.

3174. Henry Desmoutis, Paris—New metallic alloys.

Dated 7*th January*, 1858.

28. Eliza Graham, 14, Noel-street, River-terrace, Islington—An improved apparatus for threading needles.

Dated 11*th January*, 1858.

43. William Tregaskis, 37, St. Andrew's-hill, Thames-street—Improvements in the printing press.
45. Isaac Taylor, Stanford Rivers, Essex—Improvements in manufacturing metallic cylinders used in printing calico and other fabrics, and in imparting engravings to metallic cylinders used for such purposes.

Dated 12*th January*, 1858.

47. Edward Hammond Bentall, Heybridge, near Maldon, Essex—An improved arrangement of portable gearing apparatus for the application of horse power, principally for driving various kinds of agricultural machines or implements.
49. John Henry Johnson, 47, Lincoln's-inn Fields—Improvements in boilers and heating apparatus generally. (A communication.)

Dated 13*th January*, 1858.

51. Charles Barlow, 89, Chancery-lane—An improved registering water meter. (A communication.)
53. Richard Archibald Brooman, 166, Fleet-street—Improvements in the preparation of coal and other fuel. (A communication.)
55. Patrick Robertson, 1, Sun-court, Cornhill—Improvements in inkstands. (A communication.)
57. Charles Edward Matson, Charles-street, Deptford—Improvements in roughing horses' shoes.

Dated 14*th January*, 1858.

59. Nicolas Eugène Jeanroy, Rue de l'Echiquier, Paris—Improvements in the manufacture of net lace.
60. William Woodcock and Thomas Blackburn, Sough, near Blackburn, and James Smalley, Blackburn—Improvements in machinery or apparatus for heating and circulating air, to be applied to all purposes where heating is required.
61. James Alexander Manning, Inner Temple, Middlesex—Improvements in the treatment of sewerage and other polluted liquids.
62. James Broadley, Saltaire, near Bradford—Improvements in apparatus used in weaving.
63. Joseph Stenson, Northampton—Improvements in the manufacture of wrought iron.
64. Henry Ingle, Shoe-lane—Improvements in printing machines.
65. William Clark, 53, Chancery-lane—Certain improvements applicable to the paying out of submarine or submerged telegraph wires or cables. (A communication.)

Dated 15*th January*, 1858.

66. John Varley, Albion Iron Works, Radcliffe—Improvements in steam engines.
67. Charles Schinz, Camden, New Jersey, U.S.—An apparatus for manufacturing prussiate of potash.
69. David Bowlas, Reddish, Lancashire—Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.

Dated 16*th January*, 1858.

71. Richard John Badge, Newton Heath, near Manchester—Improvements in machinery or apparatus for drawing or extracting spikes or trenails from railway sleepers and chairs, and other similar purposes.
72. James Austin, Millisle Mills, Donaghadee, Ireland—Improvements in machinery or apparatus for ploughing or cultivating land.
73. Robert Archibald, Devon-vale, Tillicoultry, N.B.—Improvements in the treatment or preparation of wool, and other fibrous materials for being spun.
74. George Macbeth, Manchester—A certain improvement applicable to sewing machines.
75. Frederick Hyde, Glossop—Improvements in machinery or apparatus for spinning, doubling, twisting, or throwing cotton, silk, wool, flax, and other fibrous substances.
76. Edwin Hills, Warsash, Southampton—An improved process for manufacturing sulphate of ammonia.
77. Patrick Robertson, Sun-court, Cornhill—Improvements in lamps. (A communication.)
78. Charles Amedée de Laire de la Brosse, Paris—Improvements in apparatus or machinery for the manufacture of looped or knitted fabrics. (A communication.)
79. Edward Rosa, Edinburgh, N.B.—Improvements in the manufacture of dough and other plastic or porous substances.

Dated 19*th January*, 1858.

81. Thomas Hamilton and James Hamilton, Glasgow—Improvements in holders or bobbins for holding or containing yarn or thread, and in turning, cutting, shaping, and reducing wood and other substances.
82. Andrew Walker and Thomas Walker, Shotts, Lanark, N.B.—Improvements in the treatment or preparation of moulds for casting metals.
83. Edward Wilson, 9, Rainbow-terrace, Worcester—Improvements in pistons for steam engines driven by steam or any other elastic fluid, which improvements are also applicable to the pistons or plungers of pumps.
84. William Waller, Uddingston, near Glasgow—Improvements in machinery for grinding, bruising, breaking, and cutting cereals, grasses, and other vegetable substances.
85. William Waller, Uddingston, near Glasgow—Improvements in thrashing machines, or machinery for thrashing and dressing grain.
87. Peter Schuyler Bruff, Ipswich—Improvements in the construction of submerged tunnels.
88. Giuseppe Antonio Tremeschini, Vicenza, Venetian Lombardy—Improved methods and mechanical arrangements for applying card-board to the weaving of figured fabrics, and for arranging the card-board for this purpose.
89. Benjamin Blake Wells, Strand—Improvements in ordnance.
90. John Henry Johnson, 47, Lincoln's-inn Fields—Improvements in the boxes and journals of carriage wheels and axles, and in journals and bearings generally. (A communication.)
91. Thomas Pirie, Nether Kinmundy, Aberdeen, N.B.—Improvements in machinery or apparatus for thrashing or separating grain.
92. Philip Capon, Chancery-lane—Improvements in apparatus for binding together pamphlets, letters, music, and other loose documents or sheets.
93. Otto Von Corvin, Alfred-place, Alexander-square, Brompton—Improvements in the mode of inlaying or ornamenting in metals and other materials.

Dated 20*th January*, 1858.

94. Christopher Nugent Nixon, Ramsgate—Improvements in the application of screw power, such improvements being applicable to steering apparatus, capstans, windlasses, cranes, winches, and other mechanical purposes.
96. Thomas Heppleston, Manchester—Certain improvements in machinery or apparatus for winding yarns or threads.
100. Charles Rishworth, Sheffield—An improved construction of spring for sustaining loads and moderating concussion.
102. John James Russell, Wednesbury, Staffordshire—Improvements in apparatus used in the manufacture of welded tubes.
104. Patrick Robertson, 1, Sun-street, Cornhill—Improvements in the manufacture of paints. (A communication.)

WEEKLY LIST OF PATENTS SEALED.

January 29*th.*

2086. Thomas Markland.
2087. Henry Genhart.
2089. George Inman.
2098. William Hopkinson.
2100. Rd. Archibald Brooman.
2101. George Brooks Pettit and Henry Fly Smith.
2111. Charles Iles.
2118. Thomas Lyne.
2134. John Langford and Joseph Wilder.
2155. William Pratchitt and Samuel Horrocks.
2459. Alfred Vincent Newton.
2802. Charles Edwards Amos.

February 2*nd.*

3103. Robert Davison and James Lee.
2108. Alexander Prince.
2148. William Lyell Groundwater and Henry Prince.
2206. Robert Clark Gist.
2234. Perry G. Gardiner.
2262. Alfred Vincent Newton.
2280. Jules Alphonse Chartier.
2662. William Osborne.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

January 26*th.*

236. George Price.

January 27*th.*

237. James Howard.

January 28*th.*

234. Arthur Lyon.
1060. Edward Humphries and Thomas Humphries.

January 29*th.*

244. Thomas Ogden Dixon.
250. George Ritchie.

January 30*th.*

240. John Francis Porter.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
4048	Jan. 29.	Invalid Bed Table	Armstrong Todd	Ardwick, near Manchester.
4049	Feb. 2.	Reflectors for Stereoscopes	Murray and Heath	43, Piccadilly.
4050	„ 2.	Improved Stud or Fastener	William Cooper	Birmingham.